803.03 FINE AGGREGATE FOR BITUMINOUS CONCRETE

(A) FOR HOT ASPHALTIC CONCRETE PAVEMENT. Fine aggregate for hot asphaltic concrete pavement shall meet the general requirements of AASHTO M 29. The gradation of the fine aggregate or a combination of fine aggregates shall be such that, when combined with the other mix ingredients, it will produce the specified bituminous paving mixture. Each of the fine aggregates, when subjected to five cycles of the magnesium sulfate soundness test, shall have a weighted loss of not more than 20 percent.

Each individual ingredient or source of material combined to be fine aggregate, and the fine aggregate as a whole shall contain no clay lumps and shall be non plastic.

Fine aggregate for use in hot asphaltic concrete base course Class A and B mixtures and surface course Class C mixtures, shall consist of not less than 40 percent by weight stone screenings grading No. 10 (Table 803.02-1).

Tolerances for gradation in Table 401.02 shall apply to the fine aggregate gradation as approved in the job mix formula.

(B) FOR OPEN GRADED ASPHALT FRICTION COURSES. Fine aggregate for open graded asphalt friction courses shall be trap rock screenings which meet the quality requirements of 803.03(A). The gradation of the fine aggregate shall be such that when combined with the other mix ingredients, it will produce the specified mixture gradation.

(C) FOR SHEET ASPHALT SURFACE. Fine aggregate for sheet asphalt shall meet the quality requirements of 803.03(A). When tested in accordance with AASHTO T 27, the composite fine aggregate shall conform to the following requirements:

Sieve Designation	Percent Passing By Weight
No. 4 (4.75mm)	100
No. 10 (2.00mm)	95-100
No. 40 (0.425mm)	55-85
No. 80 (0.180mm)	15-40
No. 200 (0.075mm)	0-5

Fine aggregate and/or stone screening not conforming to the composite grading may be used when approved by the Engineer.

(D) FOR ASPHALTIC CONCRETE BINDER. Fine aggregate for asphaltic concrete binder shall meet the quality requirements of 803.03(A) and the following grading requirements.

Sieve Designation	Percent Passing By Weight
No. 4	100
No. 8	95-100
No. 100	0-25
No. 200	0-10

(E) FOR STONE-FILLED SHEET ASPHALT SURFACE. Fine aggregates for stone-filled sheet

asphalt surface shall meet the quality requirements of 803.03(A). The gradation of the fine aggregates or combination of fine aggregates shall be such that it will produce the specified bituminous mixture properties when combined with other mixed ingredients. The combined fine aggregates shall consist of not less than forty (40) percent by weight of crushed stone screenings Grade No. 10 from an approved source for a skid-resistant surface containing from eight (8) to fifteen (15) percent fines passing the No. 200 sieve. The fine siliceous natural sand shall meet the gradation requirements for mortar sand per 803.06(A) except that the quantity passing the No. 200 sieve shall not exceed six (6) percent. Mineral filler conforming to 803.05 shall be added as needed to the fine aggregates so that the composite mixture meets the requirements specified herein.

803.04 COARSE AGGREGATE FOR BITUMINOUS CONCRETE

(A) GENERAL. Coarse aggregate for use in bituminous mixtures shall be crushed stone. The portion of the total aggregate passing the No. 4 sieve shall have a sand equivalent value of not less than 35 when tested in accordance with AASHTO T 176. The portion of aggregate retained on the 9.5 mm (3/8") sieve shall not contain more than 15 percent of particles by weight so flat or elongated, or both, that the ratio between the maximum and the minimum dimensions of a circumscribing rectangular prism exceeds 5:1. Coarse aggregate for bituminous concrete shall conform to the following:

Abrasion by Use of Los Angeles Machine		
Percentage of Wear, maximum	40	
Soundness, Weighted Average, Percent Loss,		
Maximum, 5 cycles, Magnesium Sulfate		15
Total Material finer than No. 200 sieve		
(AASHTO T 11), maximum by weight		
Material which contains clay or shale	1.0	
Material free of clay or shale	1.5	

After first dry sieving on the No. 200 sieve in accordance with AASHTO T 27, the adherent coating on coarse aggregate as tested in accordance with AASHTO T 11 shall not exceed 1 percent.

(B) COARSE AGGREGATE FOR BITUMINOUS SURFACE COURSES. Coarse aggregate for bituminous surface courses shall conform to the quality requirements of 803.04(A) and aggregates containing a substantial portion of serpentine or talc minerals or carbonate aggregates containing less than 25 percent by weight insoluble residue, as determined by ASTM D 3042 in sizes No. 200 to No. 10, shall not be used in surface course mixes. Shale and other material susceptible of polish shall not be used.

(1) Coarse aggregate grading requirements for Hot Asphaltic Concrete Surface, Class C shall be as follows:

	Percent Passing
Sieve Designation	**By Weight**
1/2 inch	100
3/8 inch	85-100
No. 4	10-30
No. 8	0-10

No. 16	0-5

(2) Coarse aggregate for Open Graded Asphalt Friction Courses shall be trap rock or other non-polishing igneous rock meeting the following gradation requirement:

	Percent Passing
Sieve Designation	By Weight
1/2 inch	100
3/8 inch	85-100
No. 4	10-30
No. 8	0-10
No. 16	0-5

(C) COARSE AGGREGATE FOR BITUMINOUS BASE AND BINDER COURSES. Coarse aggregate for bituminous base and binder courses shall conform to the quality requirements of 803.04(A).

(1) Coarse aggregate for Hot Asphaltic Concrete Base, Class A shall be as follows:

	Percent Passing
Sieve Designation	**By Weight**
1-1/2 inch	100
1 inch	95-100
1/2 inch	25-60
No. 4	0-10
No. 8	0-5

(2) Coarse Aggregate for Hot Asphaltic Concrete Base, Class B shall be as follows:

	Percent Passing
Sieve Designation	**By Weight**
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

(3) Coarse Aggregate for Hot Asphaltic Concrete, Class C as specified in 803.04(B)(1), when used as a base, will not be required to meet the serpentine or carbonate requirements of 803.04(B).

(4) Coarse Aggregate for Asphaltic Concrete Binder shall be as follows:

	Percent Passing
Sieve Designation	**By Weight**
1/2 inch	100
3/8 inch	85-100
No. 40	10-30

No. 80	0-10
No. 16	0-5

803.05 MINERAL FILLER FOR BITUMINOUS CONCRETE

Mineral filler shall be limestone dust, hydrated lime or portland cement meeting the requirements of AASHTO M 17.

Fly ash shall not be used as mineral filler unless approved by the Engineer. The mineral filler shall be uniformly graded, nonplastic, free from lumps or balls or any foreign materials and shall have a moisture content of not more than 0.5 per cent when incorporated into the bituminous mixture.

Mineral filler shall be graded within the following limits:

Sieve Designation	Percent Passing By Weight
No. 30	100
No. 50	95-100
No. 200	70-100

803.06 FINE AGGREGATE FOR MASONRY MORTAR

(A) Fine aggregate shall meet the requirements of AASHTO M 45. It will be uniformly graded from fine to coarse within the following limits:

Sieve Designation	**Percent Passing By Weight**
No. 4	100
No. 8	95-100
No. 100	5-25
No. 200	0-10

(B) Fine aggregate for mortar bond test behind ceramic wall tile shall be standard Ottawa sand passing the No. 20 sieve and retained on the No. 30 sieve.

(C) SAND. Sand for use in ceramic tile mortar for scratch and float coat shall be clean washed sand and shall be composed of hard, strong, durable, clean grains, free from soft or flaky particles, shale, foam, alkali, organic matter, and other deleterious substances. It shall contain not more than 3 percent of silt by weight as determined by decantation. Sand subjected to the colorimetric test for organic impurities and producing a color darker than the standard (Organic Plate No. 3) sand shall be rejected. Sand shall be uniformly graded from coarse to fine within the following limits and in addition shall have a fineness modulus of not less than 1.90 nor more than 2.50:

Sieve Designation	**Percent Passing By Weight**
No. 4	100
No. 8	95-100

No. 16	65-90
No. 30	45-75
No. 50	10-35
No. 100	0-10

803.07 LIGHTWEIGHT AGGREGATE FOR STRUCTURAL CONCRETE

Lightweight aggregate for structural concrete shall meet the quality requirements of AASHTO M 195.

Lightweight fine aggregate shall meet the grading requirements of AASHTO M 195, Grading No. 4 to 0.

Lightweight coarse aggregate shall meet the grading requirements of AASHTO M 195, Grading No. 3/4 inch to No. 4.

803.08 AGGREGATE FOR ASPHALTIC SURFACE (LIGHT COVER)

Fine aggregate for asphaltic surface shall meet the quality and grading requirements of 803.03(C).

803.09 AGGREGATE FOR SLURRY SEAL

Aggregate for slurry seal shall meet the quality requirements of 803.03(C). When combined with mineral filler, the mineral aggregate mix shall meet the following gradation:

	Percent Passing
Sieve Designation	**By Weight**
3/8 inch	100
No. 4	85-100
No. 8	65-90
No. 16	45-70
No. 30	30-50
No. 50	18-30
No. 100	10-21
No. 200	5-15

803.10 AGGREGATE FOR BITUMINOUS SURFACE TREATMENT

Coarse aggregate for bituminous surface treatment shall be crushed stone or crushed blast furnace slag and shall conform to the quality and grading requirements of 803.04(B) and 803.04(B)(1).

For shoulder treatment, aggregate shall be light colored crushed stone. The Contractor shall submit to the Engineer samples of aggregate from at least 3 different sources so that color selection may be made.

803.11 AGGREGATE FOR RIPRAP

Aggregates for riprap shall be hard, durable, crushed, quarried, or natural stone, having an apparent specific gravity of not less than 2.4 when tested in accordance with AASHTO T 85. The water absorption shall not exceed 4 percent unless otherwise approved by the Engineer. The stone shall be free of laminations, cleavages and shall be of a quality that will not disintegrate on exposure to water or weathering. The maximum

weighted magnesium sulfate soundness loss shall be 15 percent after 5 cycles. The aggregates for the various types of riprap shall meet the following additional requirements:

(A) Class 1 riprap stone shall consist of two sizes of stone.

(1) Primary stone shall be not less than three inches thick and shall weigh not less than 50 pounds. At least 60 percent of the stone shall weigh more than 80 pounds.

(2) Chocked stone shall be fragments or spalls of the proper size to satisfactorily wedge between the primary stones as placed.

(B) Class 2 riprap stone shall be graded with a sufficient amount of smaller stones uniformly distributed throughout. At least 60 percent of the stones shall weigh more than 80 pounds each.

(C) Grouted riprap stone shall have at least 90 percent of the stone not less than 8 inches wide by 12 inches long and by 12 inches deep and shall be approximately rectangular in shape.

(D) Wire-enclosed riprap aggregate shall be round or angular stones. Not less than 95 percent of the stone shall be retained on a screen or wire having two inch square openings.

(E) Sacked concrete riprap aggregate shall consist of pit- run material of a sandy or gravel nature. The material shall be clean and free from roots, vegetable matter, or other deleterious substances. The aggregate shall meet the following gradation requirements:

	Percent Passing
Sieve Designation	**By Weight**
2 inch	80-100
No. 200	0-4

(F) Filter Aggregate for Riprap. Filter aggregates for riprap shall be hard, durable particles or fragments of crushed stone or natural gravel, screened or crushed to meet the following gradation requirements:

	Percent Passing
Sieve Designation	**By Weight**
3 inch	100
No. 4	20-50
No. 200	0-10

804 AGGREGATES FOR SOILS CONSTRUCTION

804.01 GENERAL

Samples of excavated trench and embankment material, borrow fill material for trenches and embankments, borrow soils base and subgrade gravel shall be submitted by the Contractor to the Engineer with test results. Soils shall be free from snow, ice, frozen materials, trash, brick, clay lumps, broken concrete, tree roots, sod, ashes, cinder, glass, plaster, vegetable matter and any other foreign matter.

The Engineer will approve or disapprove the material based on the test results submitted or have analyses made on excavated material prior to use of excavated material as backfill. For excavated trench material, a minimum of one analysis will be made for each 500 feet of trench.

Sampling will be performed in accordance with AASHTO T 2; sample shall be prepared in accordance with AASHTO T 27 and AASHTO T 88; the percentage of wear shall be determined in accordance with AASHTO T 96. The liquid limit shall be determined in accordance with AASHTO T 89; and the plasticity index shall be determined in accordance with AASHTO T 90.

804.02 EMBANKMENT BACKFILL

Material used in embankments shall meet the following specifications and may be rejected on visual inspection pending the testing of representative samples. No gravel or stone shall be larger than 3 inches in any dimension. The material shall have at least 10 percent, but not more than 35 percent, by weight, passing the No. 200 sieve. The soil shall have a liquid limit of not greater than 40 and a plasticity index of 6 to 15 inclusive. In confined embankment areas, the minimum plasticity index need not apply. Compaction of materials for embankment fill shall meet the density requirements per 203.03.

804.03 BLANKET SOIL

Blanket material shall consist largely of clays or mixtures of silts and clays which when compacted will present a relatively impervious surface to prevent the entrance of water. In no case shall it be principally composed of sands or coarser material.

804.04 BASE COURSE AND/OR STRUCTURAL BACKFILL

Material approved for use as a base course shall have a minimum CBR of 25 (AASHTO T 193) when prepared in accordance with AASHTO T 180-D.

(A) BANK RUN GRAVEL FOR BASE COURSE OR STRUCTURAL BACKFILL. Coarse aggregate retained on the No. 10 (2.00 mm) sieve shall consist of hard, durable particles or fragments of stone, gravel or slag; materials that break up when subjected to freeze-thaw or wetting-drying action shall not be used. Coarse aggregate shall have a percentage of wear, by the Los Angeles test, of not more than 50.

Fine aggregate passing the No. 10 (2.00 mm) sieve shall consist of natural and crushed sand, and fine mineral particles passing the No. 200 (0.075 mm) sieve. The fraction passing the No. 200 sieve shall not be greater than 2/3 of the fraction passing the No. 40 (0.425 mm) sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6. The composite material shall conform to the following gradation requirements, including the specified tolerances:

Sieve Designation	Percent Passing By Weight	Job Mix Tolerances (Percent Passing By Weight)
2 in.	100	-2
1 in.	70-100	±5
3/4 in.	60-95	±8
No. 4	40-75	±8
No. 10	25-65	±6
No. 40	10-45	±5
No. 200 Base Course	2-10[(1)]	±3
No. 200 Structural Backfill	2-15[(1)]	±3

[(1)] Upper limit shall be 8 percent when freezing and thawing will occur to prevent frost heaving.

(B) GRADED CRUSHED STONE BASE. Crushed aggregate shall consist of crushed stone having hard, strong, durable particles, and conforming to the applicable requirements of ASTM D 2940 for Bases.

Additional fine aggregate shall consist of material of the same type and quality as specified above for the coarse aggregate. The use of soil fines or natural sands will not be permitted.

The coarse aggregate and additional fine aggregate shall be so proportioned as to produce a final mixture meeting the following gradation requirements, including the tolerances:

Sieve Designation	Percent Passing by Weight	Job Mix Tolerances (Percent Passing By Weight)
2 inch	100	- 2
1-1/2 inch	95-100	+ or - 5
3/4 inch	70-92	+ or - 8
3/8 inch	50-70	+ or - 8
No. 4	35-55	+ or - 8
No. 30	12-25	+ or - 5
No. 200	0-8	+ or - 3

(C) RECYCLED MATERIALS, FOR BASE COURSE. Crushed recycled material may be used in lieu of soil base material as directed by the Engineer.

Materials of this type for use in base course shall meet the following specification requirements.

The combined aggregate for this use shall consist of crushed concrete or mortar, crushed stone, and crushed or uncrushed sand and gravel. Materials that break up under alternate freezing and thawing or wetting and drying shall not be used.

Coarse aggregate retained on the No. 10 sieve shall have a percentage of wear of not more than 50.

The fraction passing the No. 200 sieve shall not be greater than 2/3 of the fraction passing the No. 40 sieve. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 6.

The composite material shall be free from vegetable matter and lumps or balls of clay and shall conform to the following grading requirements, including the tolerances:

Sieve Designation	Percent Passing By Weight	Job Mix Tolerances (Percent Passing By Weight
2-1/2 inch (63mm)	100	-2
2 inch (50mm)	90-100	±5
3/4 inch (19mm)	60-90	±8
No. 4 (4.75mm)	30-60	±8
No. 10 (2.00mm)	20-45	±6
No. 40 (0.425mm)	10-30	±5
No. 200 (0.075mm)	4-12	±3

(D) SLAG FOR BASE COURSE. The quality and grading requirements for slag used as a base course shall conform to 804.04(A).

804.05 TRENCH BACKFILL

Material used in trench backfill shall be a well graded soil- aggregate mixture with ten percent, but no more than 35 percent, by weight, passing the No. 200 sieve. The soil shall have a liquid limit not greater than 40 and a maximum plasticity index of 10.

Within one foot of the pipe, no gravel or stone shall be larger than 1-1/2 inches in any dimension.

For remainder of trench, no gravel or stone shall be larger than four (4) inches in any dimension, and not larger than one inch within two feet of finish grade.

Backfill shall be free from snow, ice, frozen materials, trash, brick, clay lumps, broken concrete, tree roots, sod, ashes, cinders, glass, plaster, organic matter and any other foreign matter.

Backfill shall have a minimum dry weight density of 100 pounds per cubic foot.

Backfill shall have a uniform moisture content suitable for compaction to the specified density. The Contractor shall moisten or dry soils materials to obtain a suitable, uniform moisture content. If the materials are of such nature that heaving, pumping, rutting, or shearing occurs in the compacted backfill under the action of construction equipment, even though soil meets density requirements, affected material shall be replaced to limits as directed.

804.06 TRENCH SUBGRADE GRAVEL

Gravel to backfill trench undercut areas shall be per ASTM C 33, Grading Size No. 57.

804.07 FLOWABLE BACKFILL

(A) DESCRIPTION. This work shall consist of placing flowable backfill in lieu of compacted soil or aggregate backfill in underground utility lines.

(B) MATERIALS. Materials used in flowable backfill shall conform to the requirements of the following specifications and standards:

Hydraulic Cement - 801.01.

Fly Ash - AASHTO M295, Class F.

Water - 821.01.

Aggregates - 803.01.

Admixtures - 814.04 and 814.05.

Do not use calcium accelerators with fly ash.

(C) MIX DESIGN. The mix design for flowable backfill shall be provided by the Contractor. Flowable backfill shall have a design compressive strength of 50 to 150 psi. at 28 days when tested in accordance with AASHTO T-23. The Contractor shall be responsible for providing a flowable mixture using these guidelines and adjusting the mixture design as called for by circumstances or as may be directed by the Engineer. The Contractor shall submit a mix design for approval supported by laboratory test data for one (1), three (3) and twenty eight (28) day compressive strengths. The mix design shall be approved by the Engineer prior to beginning work.

(D) CONSTRUCTION. Mixing and transporting shall be in accordance with 501. or by other methods approved by the Engineer.

When used as backfill for pipe and floatation or misalignment occurs, correct alignment shall be assured by means of straps, soils anchors or other approved means of restraint.

(E) MEASURE AND PAYMENT. The unit of measure for Flowable Backfill will be the cubic yard, complete in place. Payment for Flowable Backfill will be made at the contract unit price per cubic yard, which payment shall include furnishing and placing flowable backfill and for all materials, labor, tools, equipment and incidentals necessary to complete the work.

When not shown as a pay item in the contract documents, flowable backfill will be measured as specified above; however, it will be considered as a substitution for the appropriate item and payment will be made at the contract unit price per cubic yard for that item. Such price shall be full compensation for furnishing and placing flowable backfill and for all materials, labor, tools, equipment and incidentals necessary to complete the work.